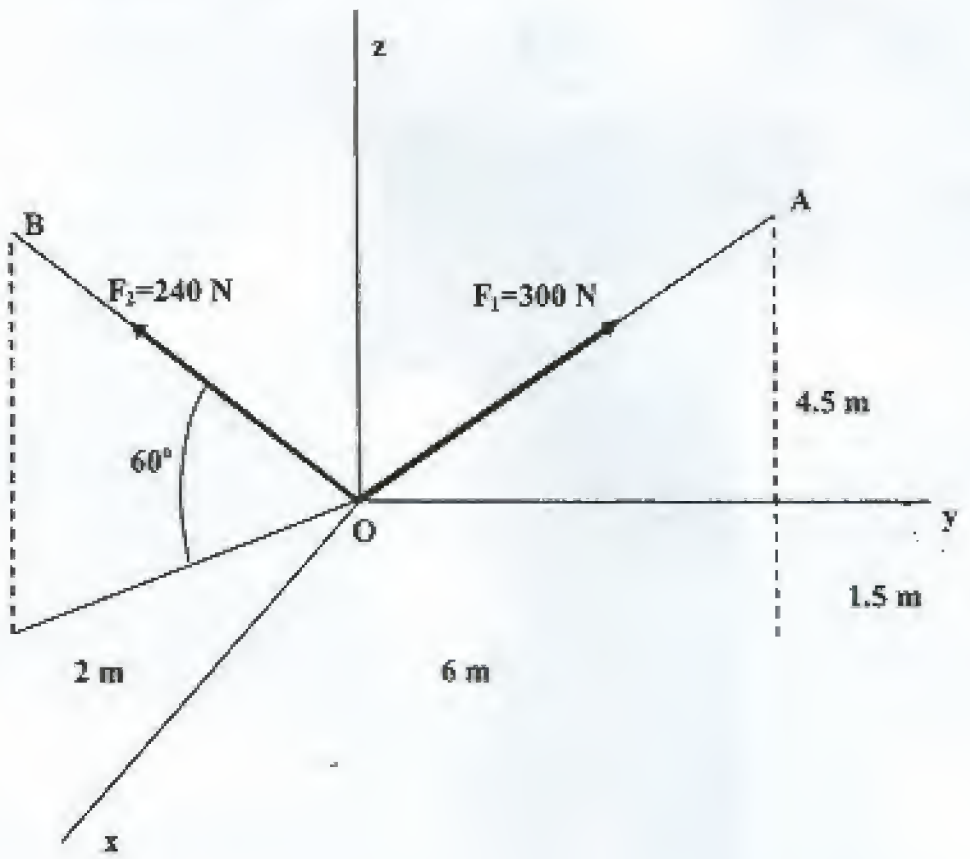
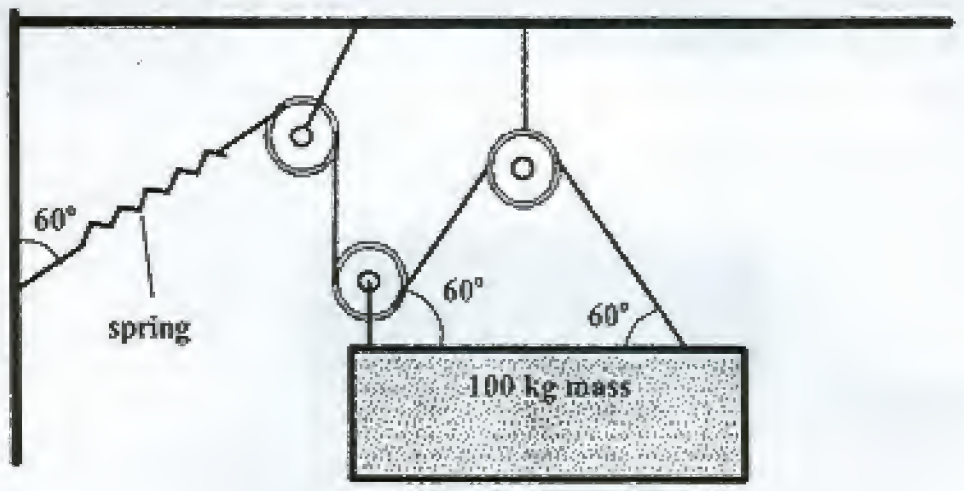
dec 2001

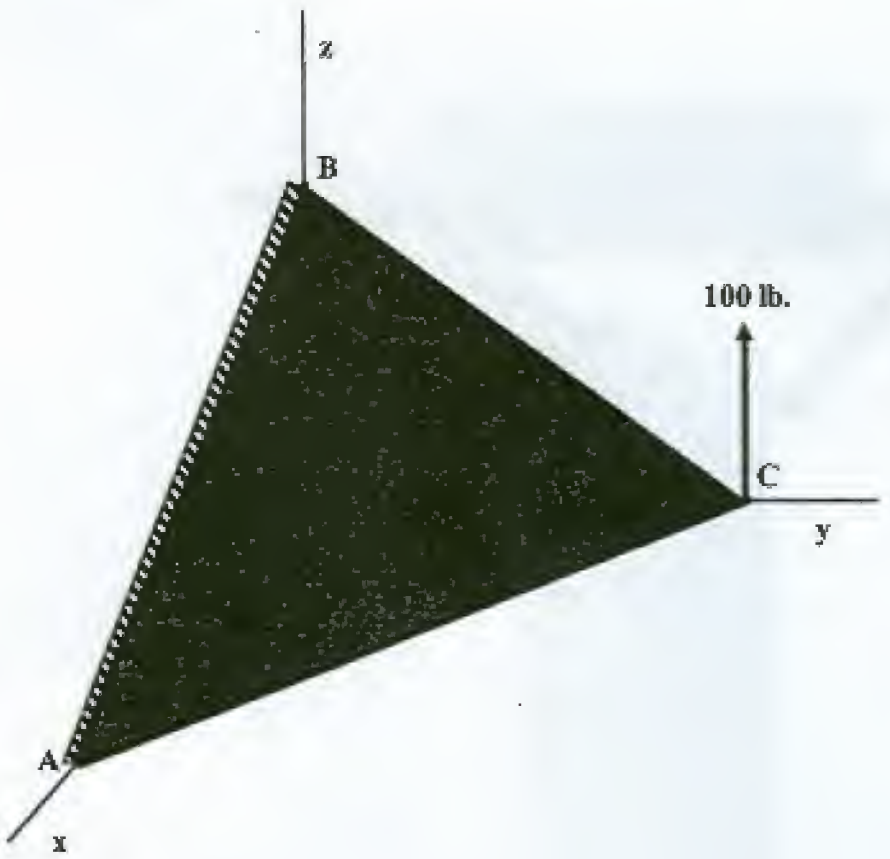
1) Two forces are applied at a point in a body as shown below. Determine:
a) The magnitude and direction (expressed by directional cosine angles) of the resultant, R, of the two forces.
b) The magnitude of the component of force F_1 that acts along the line of action of force F_2.
c) The angle between forces F_1 and F_2.



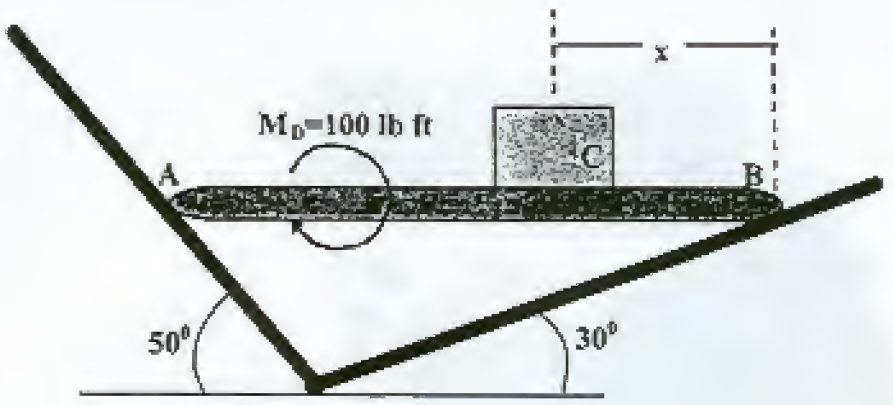
2) A mass of 100 kg is supported by the cable and frictionless 3-pulley system shown below. If the spring was 1 m long before being stretched, calculate its final length under the loading shown below. (Spring constant = 10 N/mm)



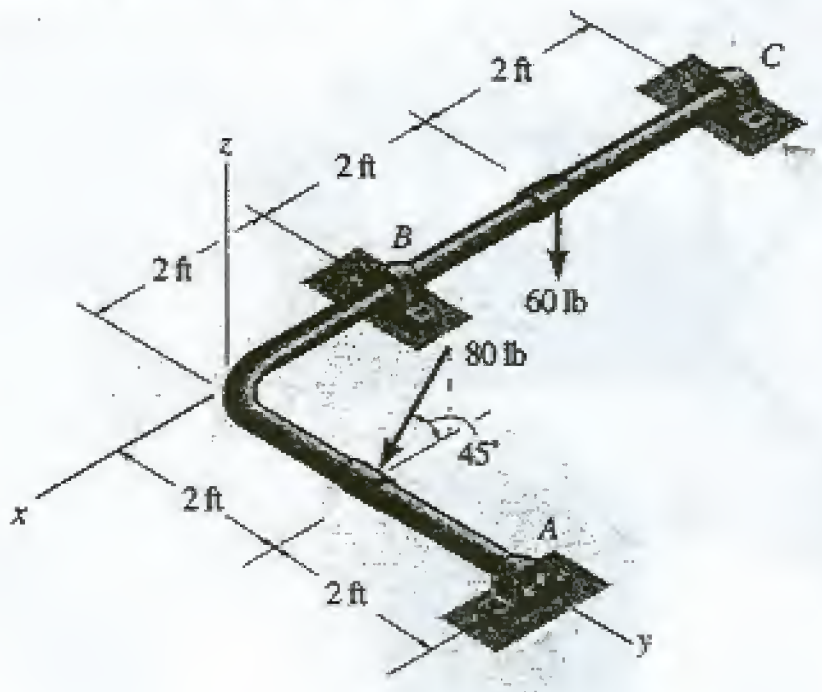
3) A triangular shaped lid, ABC, is to be opened along the hinged axis AB by a vertical upward force of 100 lb applied at C. The distances are shown in feet.
a) Calculate the magnitude of the moment that the 100 lb force develops about the origin, O, and about the axis AB.
b) Express the above moments as Cartesian vectors.



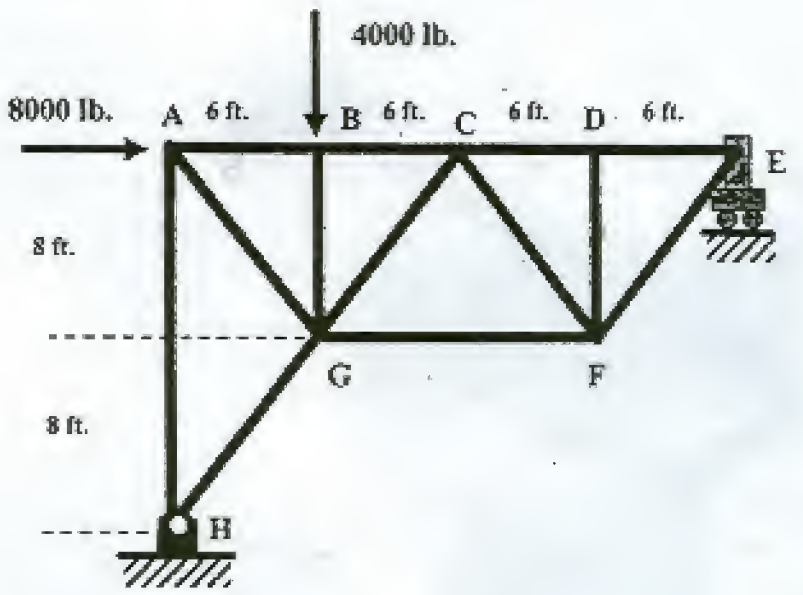
4) The beam AB, supporting Block C and a moment M_D, rests on frictionless inclines. Determine the distance, x, that block C is to be located from the right end of the bar for equilibrium to occur. Block C weighs 20 lb and the weight of the bar AB can be neglected. The beam is 10 feet long.



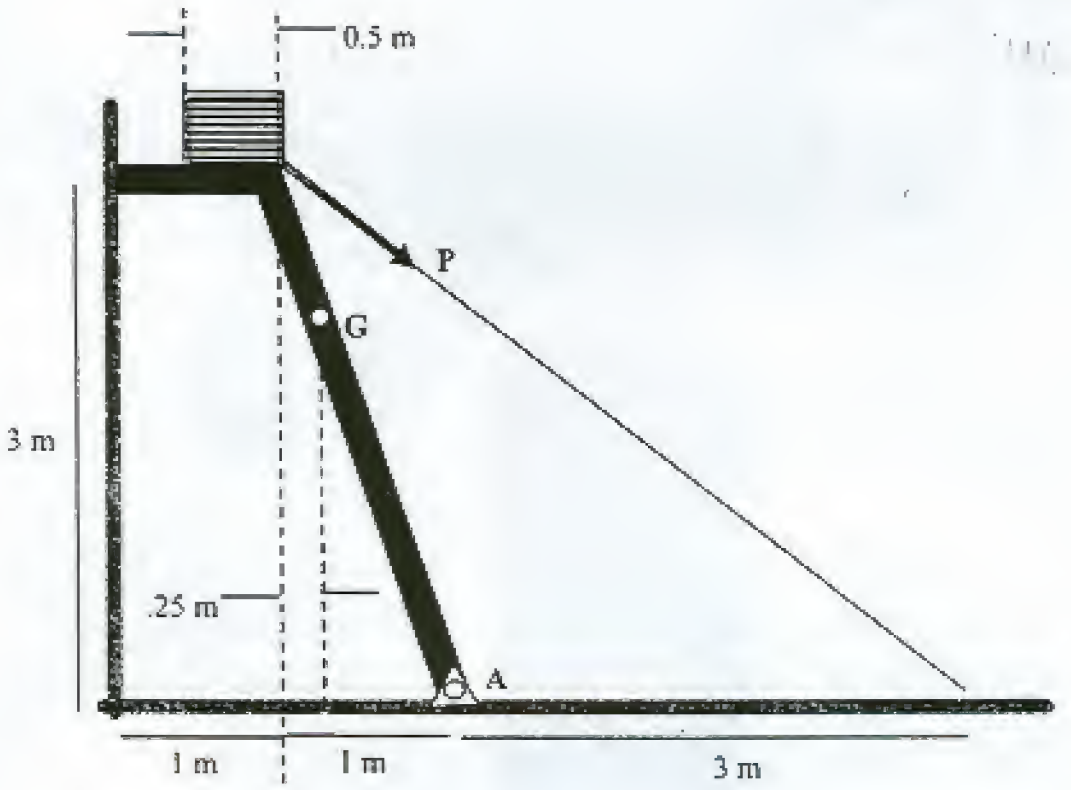
5) The rod is supported by journal bearings at A, B, and C. Determine the x, y, and z components of the reactions at these supports due to the loading shown. The bearings are in proper alignment and exert only force reactions on the rod.



6) Find the forces in members CD, CF, GF and DF in the truss shown below. The truss is supported by a pin at H and a roller at E.



7) Temporary scaffolding is placed against the wall of a building as shown below. A rope is attached to the corner of a uniform box sitting on top of the scaffolding. The scaffolding is pinned to the floor at A. What force P is required to cause motion. (μ_s=0.4). Assume that the scaffolding is a single rigid body. The weight of the box is 300 N. The weight of the scaffolding is 500 N. The center of gravity of the scaffolding is shown as G.



8) The frame shown below is loaded by a force of 1000 lb. Calculate the magnitude and direction of the resultant reaction force at A and at C, acting on member AD. The pulley has a radius of 1 foot.